GSFC Technology Development Center Report

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Abstract

This report summarizes the activities of the GSFC Technology Development Center for 2003. The report forecasts activities planned for the year 2004. The GSFC Technology Development Center (TDC) develops station software including the Field System (FS), scheduling software (SKED), hardware including tools for station timing and meteorology, scheduling algorithms, operational procedures, and provides a pool of individuals to assist with station implementation, check-out, upgrades, and training.

1. Technology Center Activities

The GSFC IVS Technology Development Center (TDC) develops hardware, software, algorithms, and operational procedures. It provides manpower for station visits for training and upgrades. There are other technology development areas at GSFC covered by other IVS components such as the GSFC Analysis Center.

The current staff of the GSFC TDC consists of Nancy Vandenberg, Ed Himwich, Chuck Kodak, Raymond Gonzalez, John Gipson, and Willam Wildes.

The remainder of this report covers the status of the main areas of development that are currently being pursued.

2. Field System

During this period some new features were released in FS version 9.6:

1. support for Mark 5A recorders
2. support for the ATNF LBA DAS (provided by J. Quick, HartRAO)
3. support for MET3 meteorological sensors with stand-alone logging independent of the FS available
4. improved TAC support with stand-alone logging independent of the FS available
5. numerous improvements in the new system temperature scheme including improved robustness
6. numerous small bug fixes and improvements were added

The new FS Linux Distributon 5 was released. This was developed with the assistance of J. Quick (HartRAO). This new distribution is based on the Debian "woody" distribution and includes up to date versions of various packages and, most importantly, current security patches.

A new PC configuration for FS operations was defined. The most significant change in the configuration is that now three IDE hard disks are used instead of two SCSI disks. The change to IDE was possible because performance of the kernel IDE driver has improved significantly. Because of the cost savings in the change to using IDE drives, it is now feasible to have three disks. This allows a more robust "rotating" back-up scheme to be used.

In the next year, several other improvements are expected, among these are: (1) integrated support for Mark 5A recorders including support for schedules written for Mark 5A systems, (2) integration of S2 DAS support (to be provided by M. Bérubé, NRCanada), (3) fsvue will become the primary user interface for the FS (this will allow simultaneous use of remote and local FS consoles), (4) support for station specific detectors in the new ONOFF program, and (5) an ANTTAB file generation script will be included.

3. SKED and DRUDG

The GSFC Technology Development Center is responsible for development, maintenance, and documentation of the SKED and DRUDG programs. These two programs operate as a pair for preparation of the detailed observing schedule for a VLBI session and its proper execution in the field. In the normal data flow for geodetic scheduling, first SKED is run at Operation Centers to make the .skd file that contains the full network observing schedule. Then the stations use the .skd file as input to DRUDG for making the control files and procedures for their station. During 2003 many changes were made to both SKED and DRUDG.

SKED had the following features added to it:

1. SRCFLR. This allows a user to specify a target number of observations for the first N sources in the source list. For example, you could specify that you wanted the first 10 sources to each have at least 1.5% of the total number of observations. This option is useful if you have some sources in a session that you want to observe. For example, the RDV experiments have a set of core sources, and a set of sources that are scheduled periodically. It is important that when the later sources are scheduled that they be observed.
2. SRCDIST. This option imposes soft constraints on the number of observations per source. There are four modes: NONE, UPTIME, EVEN, SQRT.
   (a) NONE imposes no constraint.
   (b) UPTIME tries to have the number of observation per source be proportional to the total uptime of the source. This will emphasize sources that are visible by most of the network.
   (c) EVEN tries to make the number of observations per source be the same for all sources.
   (d) SQRT tries to make the number of observations per source be proportional to the square root of the uptime. This smooths out the distribution of observations.
3. FILL IN MODE. In a given scan typically some of the antennas will stop observing before others. If FILL IN MODE is turned on, SKED monitors the idle time to see if it can squeeze in additional observations during this idle time.
4. BEST N. Sked was modified to choose the BEST-N sources based on observing strength and station geometry for a given experiment. This obviates the need for a scheduler to choose these sources by hand.

Another option that was partially implemented during the latter part of 2003 was the implementation of an automatic source-monitoring program. There are several goals to this program:

1. Observe all sources frequently enough to monitor their flux density.

2. Increase the number of sources used in scheduling geodetic experiments.
3. Make the selection of the sources automatic.

We developed a database containing a list of all the sources observed by the various member institutions of IVS since the inception of geodetic VLBI in 1979. For each experiment and each source this database contains information on the number of observations scheduled, the number of observations correlated, and the number of good observations. This database can be queried by SKED to select sources that have not been observed recently.

Several changes were made to DRUDG to support the increasing use of Mark 5 recorders. These included the addition of two new modes:

1. Mark 5A piggy back mode allows stations to record simultaneously on tapes and Mark 5A recorders. The tape recorder is attached to the first output of the formatter, and the Mark 5A modules are attached to the second output.
2. Mark 5A mode allows stations to record using the Mark 5A modules as the primary recorder. The Mark 5A modules are attached to both outputs of the formatter.
3. Mark 5A pig-wire mode allows stations to record using the Mark 5A recorders as the primary recorder when these are attached to the second output of the formatter (same as for piggyback mode).

In all of the above modes the schedules are first generated by SKED as if the experiments were going to be recorded on tape. Then the recorder type is changed in DRUDG. This is necessary because SKED is not yet Mark 5 aware. Another reason for doing it this way is that number of Mark 5A units increased over the course of the year. Scheduling the experiments to use tape seemed to be prudent. You could always change the schedule to use disk at the stations. The converse operation is more problematic, because SKED allocates time for tape change. If the experiments were scheduled to use Mark 5A recorders this time would not be allocated.

One of the primary goals for next year include making SKED Mark 5 aware.